of a typhoon, a theory which has always been advanced, but, so far as I know, has never hitherto been substantiated by any actual observations. The case of the *Siam* is a strong argument in favour of the truth of such a theory, for in point of fact it may be said to have scarcely felt the effects of the typhoon at all.

Should any of your readers be disposed to sift the various evidences which I have adduced, the papers are in my possession, and access can be had to them at any time.

FRANK ARMSTRONG

NOTES

WE have received full intelligence of the English Eclipse Expedition from Mr. Lockyer, under date Galle, November 29. At that date the expedition had been detailed into various parties for service at different stations in Ceylon and the mainland; the instructions to these several parties are reprinted in another column. Mr. Lockyer, Dr. Thomson, and Captain Maclear were to observe at Ootacamund, Mr. Davis being detached to photograph at Gunote; Messrs. Abbay and Friswell were to go to Manantawaddy, Signor Respighi and Mr. Holliday to Poodacottah; while Captains Tupman and Fyers and Messrs. Moseley and Lewis were to proceed to Trincomalee. The Indian and Cingalese authorities and the officers of the *Mirzapore* and *Glasgow* had exerted themselves to the utmost to assist the expedition, and the Ceylon party acknowledge great obligation to Captain Fyers, the Surveyor-General. In another column will be found an account of the voyage out.

WE hear with great satisfaction that Mr. Edgar Leopold Layard, C.M.Z.S., has received the appointment of H.B.M. Consul at Para. Mr. Layard has already done good service to science in Ceylon and South Africa, and will now have the pleasure of investigating the fauna and flora of a third and not less interesting region. Before leaving England we understand that Mr. Layard will publish a new and revised edition of his work on "The Birds of the Cape Colony," which is now nearly ready for the press.

WE are informed that Mr. Leighton is preparing for publication a conspectus of all the Lichens hitherto discovered throughout the world, with diagnoses, &c., and also a second edition of the Lichen Flora of Great Britain, Ireland, and the Channel Islands, which will combine an Introduction, Glossary, and Index, and which, it is hoped, will be ready for the press early in 1872. The Glossary, &c., will be printed separately, so as to enable possessors of the first edition to purchase separately.

MR. T. K. SALMON, of Guildford, is making preparations to start on a collecting expedition to the highlands of the Columbian republic. Mr. Salmon's head-quarters will be at Medellin, in the State of Antroquia, whence he will explore the Cordillera of Quindin, and upper valley of the Cauca. Mr. Edwin Gerrard, jun., of College Street, Camden Town, acts as his agent, and will be happy to receive subscriptions in aid of the expedition.

WE are glad to hear that the well-known naturalist, Mr. W. T. Blanford, of the Indian Geological Survey, is appointed a member of the British expedition for the survey of the boundary between Persia and Beloochistan. Commencing on the coast of Mekran the party will pass northward to Seistan and Herat. In Seistan they will enter a most interesting region, of which the geology and zoology are quite unknown. The river Helmund, and Lake of Seistan, in which it loses itself, will certainly present many features eminently worthy of scientific investigation, of which no one is more qualified to take advantage of than the ex-geologist of the Abyssinian Expedition.

THE recent death of Dr. Seemann, who for nine years has conducted the *Journal of Botany*, has caused a change of editorship. A new (2nd) series will be commenced in 1872, under the management of Dr. Trimen, of the British Museum, for the last two years a sub-editor, with Mr. Baker, of Kew, who will continue to be associated with Dr. Trimen in the conduct of the new series. We are also requested to state that unavoidable circumstances will delay for a few days the publication of the January number.

THE Edinburgh papers record the death of Mr. J. B. Davies, assistant-keeper of the natural history section of the Museum of Science and Art in that city. Mr. Davies was appointed to his position in the museum, while it was in its old place in the College, by Edward Forbes during the brief period that gifted naturalist occupied the Chair of Natural History; and in the discharge of his duties he was as much distinguished by the extent and accuracy of his knowledge as by his readiness to assist all students of his science, and by his courteous bearing. In addition to his appointment in the museum, Mr. Davies held the lectureship on zoology in the Royal High School, was assistant-secretary to the Royal Physical Society, and an Associate of the Botanical Society. He was the author of a little manual of practical natural history termed "The Naturalist's Guide."

THE following have been elected office-bearers of the Edinburgh Botanical Society for the ensuing year:—President, Prof. Wyville Thomson, LL.D.; Vice-Presidents, Dr. M'Bain, R.N., Prof. Dickson, Mr. Buchanan, Dr. T. A. G. Balfour; Secretary, Prof. Balfour; Foreign Secretary, Prof. Douglas Maclagan; Treasurer, Mr. P. N. Fraser; Auditor, Mr. Tod; Artist, Mr. Neil Stewart; Assist. Sec. and Curator, Mr. John Sadler.

IN connection with the Gilchrist Education Trust, arrangements have, we understand, been made for the delivery at the Lambeth Baths of a series of lectures, chiefly of a scientific character. The names of Prof. Huxley and Dr. Carpenter are mentioned among the probable lecturers.

MM. DELAUNAY and Ch. St. Claire-Deville have presented to the French Academy of Sciences some further interesting notes of the cold of November and the early part of December. M. Delaunay remarks that the cold advanced, as is usually the case, from north-east to south-west. The minimum temperatures were recorded at Gröningen, in Holland, on Dec. 7 (– 10° C. = 14° F.); at Brussels (– 12°·6 C. = 9·5° F.) on the 8th; and at Paris (– 21°·3 = – 6° F.) on the 9th. This extremely low temperature appears to have been limited to a very small tract of country between Paris and Charleville. On the same day the temperature was above the freezing-point in Scotland as far north as Nairn, and in the greater part of England, falling only at Greenwich as low as – 2°·3 C. (= 28° F.). The severity of the frost was considerably mitigated at Paris on the 10th and 11th; but on the latter date it was again as low as – 22°·6 C. (= – 8°·5 F.) at Haparanda, on the Gulf of Bothnia, – 15° C. (= 5° F.) at Stockholm, and – 14°·1 C. (= 6°·5 F.) at St. Petersburg.

SOME of our readers will recollect the controversy which took place in the "Proceedings of the Zoological Society" and the *Athenæum*, some six months ago, respecting a tortoise's skull in the British Museum, upon which Dr. Gray had established a new genus and species, *Scapia falconeri*. Mr. Theobald maintained that this skull (received by the British Museum from the executors of the late Dr. Falconer) had originally belonged to one of the two typical specimens of Mr. Blyth's *Testudo Phayrei*, in the Indian Museum, Calcutta, and that consequently *Scapia falconeri*, Gray = *Testudo phayrei*, Blyth. Dr. Blyth maintained the contrary. We understand that the director of the Indian Museum has recently claimed the skull in question, and that it is now on its way back to Calcutta, so that the authorities of the British Museum must have given up their view of the question.

AT a recent meeting of the Manchester Literary and Philosophical Society, Mr. John Hopkinson, B.A., D.Sc., detailed some experiments on the subject of the rupture of iron wire by a blow, the results of which are—1. That if any physical cause increase the tenacity of wire, but increase the product of its elasticity and linear density in a more than duplicate ratio, it will render it more liable to break under a blow. 2. That the breaking of wire under a blow depends intimately on the length of the wire, its support, and the method of applying the blow. 3. That in cases such as surges on chains, &c., the effect depends more on the velocity than on the momentum or *vis viva* of the surge. 4. That it is very rash to generalise from observations on the breaking of structures by a blow in one case to others even nearly allied, without carefully considering all the details.

WE learn from the *Lancet* that all the English universities have now accepted the draft scheme for a Conjoint Examination Board, as proposed by the College of Physicians and the College of Surgeons of England, and that it only now remains to submit the matter to the standing counsel of the two latter bodies for their opinion as to the practicability of carrying out the scheme without in any way violating the provisions of their respective charters. It is pretty well known that in the case of the Royal College of Physicians no difficulty at all is apprehended. It is probably so with the College of Surgeons, but of this we have never had positive assurance.

ATTENTION has been called to the present disgraceful state of the fine mausoleum erected to the memory of Sir John Soane, in the cemetery of St. Giles-in-the-Fields, King's Cross. The tomb of the founder of the first art museum and architectural library in England is surely deserving of preservation. At present, however, its balustrades are broken, its marble capitals chipped, the inscription wilfully defaced, and the entrance filled with brick rubbish. We commend this state of things to all art students.

IN the current number of *La Philosophie Positive*, Nov.—Dec., 1871, M. Littré calls attention to the reorganisation of public education in France. "If we are ever," he says, "to have a public system guided by a sound general method, we must begin tentatively and experimentally with private effort;" he then adds, "As for ourselves, it is intended among the writers in this review to compose six treatises, one for each of the fundamental sciences, mathematics, astronomy, physics, chemistry, biology and sociology. They should be so subordinated one to another that each science should form an introduction to the next above it in the scale; they should also be so far restricted to what is of essential importance that the entire course might be mastered in a time compatible with the necessities of life; and complete enough to raise the student to the main level of positive knowledge." There has been a good deal of discussion, especially in this country, about the scientific value of Comte's classification of the sciences. Perhaps a practical experiment like the above is the best criterion of the question, and the wonder is that it has not been applied before.

AFTER unexpected delays, the new Coast-Survey exploring vessel, the *Hassler*, left Boston on December 4, bound for California *viâ* the Straits of Magellan. The *personnel*, which is under the scientific direction of Prof. Agassiz, and the plans of this expedition, have already been given.

Harper's Weekly gives the following account of the labours of Prof. E. P. Cope, of Philadelphia, mainly in the valley of the Smoky Hill Fork of the Republican River in Kansas, where, under the protection of an escort of seventy-five infantry, commanded by Captain Butler, and detailed by order of General Pope, he spent seventeen days in the diligent prosecution of his labours. As is well known to American palæontologists, this region is one of the richest of the world in fossil remains of reptiles and fishes. Of these a large number of specimens were obtained by Prof. Cope, many of extraordinary magnitude, and some of them entirely new to science. More or less complete series were obtained of the bones of animals previously known only by a few fragments, thus supplying much better information as to their affinities and position in the system. Nearly the entire skeleton of a large fish, provided with teeth of immense power, was exhumed. This animal is to bear the name of *Portheus molossus*; and its remains occurred in such abundance as to demonstrate that it must have been a characteristic and very formidable inhabitant of the cretaceous seas. Another discovery was that of a reptilian form related to or intermediate between the tortoises and serpents. The ribs of this animal were long and attenuated; but instead of being united in the carapace, as in the tortoise, remained separate possibly united by membrane. If built at all on the chelonian pattern the expanse would have been at least twenty feet. This is to be called *Protostega gigas*. During his explorations in 1870 Prof. Marsh ascertained the existence of a species of pterodactyl, or flying lizard, in the cretaceous strata of the West, and additional specimens of the same or another species were found by Prof. Cope during the expedition just referred to. The most gigantic reptiles met with by him this year were species of *Liodon*, *Polycotylus*, and *Elasmosaurus*. Of these *Liodon* was found most abundantly, and one specimen will probably prove to be the largest of all known reptiles. *Elasmosaurus* had the most massive body, and must have presented an extraordinary appearance, in consequence of the great length of its neck.

WE have already referred occasionally to investigations prosecuted during the past summer on the great lakes of North America, into the fauna and physical condition of the deeper waters; and we find in the last number of *Silliman's Journal* a more detailed account of that portion of the work carried on in Lake Superior upon the U.S. steamer *Search*, under the direction of Gen. Comstock, of the Lake Survey, as reported by Mr. Sydney J. Smith, the zoologist of the expedition. The deepest water met with was 169 fathoms, the bottom being there covered, as in all the deeper portions of the lake, with a uniform deposit of clay or clay mud; and not the slightest trace of saline matter was detected in the water in any part of the lake. The temperature, everywhere below thirty or forty fathoms, varied very little from 39° F, although in August it varied at the surface from 50° to 55°. The fauna at the bottom was found to correspond to these physical conditions. In the shallow waters the species vary down to thirty or forty fathoms, after which the deep-water fauna begins, and the species appear to be uniformly distributed. The list of species is meagre, and the deep-water region is characterised rather by the absence of many of the shore species than by the presence of any peculiar class. The same crustaceans and marine forms met with in 1870 in Lake Michigan were also found here abundantly, together with the same species of *Pisidium*; and some of the crustaceans have so far been undistinguishable from those found in Lake Wetter, in Sweden. The detailed account, of which that in the *Journal of Science* is an abstract, appears in the report of the Chief Engineer of the army to the Secretary of War just presented to Congress (Report of American Secretary of War, vol. ii. p. 1020).

M. RAOULT states, in a paper read before the French Academy of Sciences, that cane sugar becomes transformed into grape sugar under the prolonged influence of light. Having dissolved 10 grammes of white sugar in 50 grammes of pure water, and boiled the solution for a few minutes, he placed equal portions in two white glass tubes, which were then hermetically closed. One was deposited in a dark place, while the other was exposed to light. Five months afterwards the tubes were opened, and the contents of that which had been exposed to light gave the reaction of glucose.

A CORRESPONDENT of the *Madras Times* states that on the night of the 21st of October a remarkable meteor was seen at Trevandrum. It first became visible in the northern part of the sky, proceeding at a rapid rate and in a straight line, at an elevation of from 35° to 40°. It was visible for about four seconds.

A BRAHMIN astronomer at Surat has "predicted" that a terrible earthquake will be felt in some parts of the Bombay Presidency either in December or January next.

INDIAN papers state that during the first six months of this year as many as 183 tigers and cubs, 393 panthers and leopards, 203 bears, 281 wolves, and 188 hyenas, were destroyed in the Central Provinces at a cost to the Government of about 9,000 rupees (900*l*.). What a chance for any enterprising Zoological Museum!

WE do not look for zoological statistics in the annals of trading companies; but there is one report that does afford material, that of the Hudson's Bay Company. There we see year by year the varying number of fur-bearing animals, given in a kind of Registrar-General's return of deaths. This year we do not see the details, but we learn there has been a great dearth of martens. A more serious ethnological fact is the great losses by small-pox among the Indians of the Saskachewan district, being no less than 3,000. Throughout the Hudson's Bay district the Canadian Government is employed in regulating the Indians, but this no less forebodes their extinction; the more particularly as a railway is advancing to the Pacific, and steamers are to be placed on the Saskachewan river and Lake Manitoba. Martens that are not killed and Indians that die mean reduced dividends to the Hudson's Bay shareholders and traders.

ON the Chilian map is to be placed Augol, just made a city. It is situated in lat. 37° 42′ S., long. 72° 17′ W., about three miles south of the head waters of the river Verzaro, and twenty-eight miles from Nacimiento. It was founded Dec. 6, 1862, and is a fortified place on the river Pecoiquen.

AT Santiago, in Chile, a zoological garden is to be formed in the Quinta Normal, or Normal Garden.

FROM recent accounts in the *Panama Star and Herald*, it appears the Panama pearl fisheries are now carried on by negroes, whose villages remind the traveller of Western Africa. The value of the fishery is about 30,000*l*. a year, but signs of exhaustion are now showing themselves. This is greatly attributable to the use of diving machines. A gentleman who owns one of the islands, having regulated his fisheries in the Ceylon manner, found that after two years' repose he got a larger crop. It is therefore suggested to regulate the Panama fisheries by law.

COAL has been discovered at Neblinto in Chile. That country is already largely engaged in the shipment of coal.

MUSCAT is now to be divided on the maps into two states, Muscat and Sohar, a once famous name.

THE diamond capital of Adamanta, at the Cape, is likely to become a permanent town. Its present settled and floating population is 20,000.

THE collector of Tinnevelly, in Madras, reports that he has come to the conclusion, after his inspection of the Government Pearl Fisheries, that the oysters migrate every year when young.

THE miners of Copiapa in Chile have undertaken an exploration by subscription of the rich mineral resources of their Cordillera.

NUMERIC RELATIONS OF THE VERTEBRATE SYSTEM[*]

THERE are five (not four only) complete neural rib arches to to the cranium of all vertebrate animals, to wit: (1) The condylar or sensitive belt with the condyle plates for side ribs, and the lower arch of the transversely bipartite occiput for its vault piece; (2) the petrosal or acoustic, containing the auditory nerves in its side beams (easily detected by removing the ear drum of Felines, &c.), and overarched by the interior belt of the occipital squama; (3) the parietal belt originally containing the true gustative of fixed tastes (sour, sweet, salt and bitter, the glosso-pharyngeal), in an incision; from which it is, however, soon crowded out by the internal carotid artery and the overlapping "acoustic rib blade." The next (4) is the optic or frontal, visibly succeeded, in fishes, by (5) the ethmoidal or olfactory vertebra. The rest of the cranium is formed by its "extremities" or prehensile appendages.

The same numeric law which pervades the entire vegetable kingdom reoccurs in the human fabric in a very marked manner.

The number of "radiating elements" in a coil or whorl, or of whorls in a cycle, or in cycles generally speaking, as in pine cones and flower buds, &c., are the following:—

1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, &c., progressing by the summation of the last two numbers.

The bands or parallel coils of flowers or scales in pine cones, sunflower discs, &c., embody these numbers successively, as they grow steeper and steeper, alternately on the right and left. The vertical bands, or columns, give the number of parts of the cycles involved.

The explanation heretofore given by me is this, that one element generates the other.

The elements are radial; they are bilateral rays, with a rift, so to speak, on the opposite side. It is there where, in a like manner as the seed-leaves of flowering plants produce prolific "ovules," new radial organs are developed from the preceding ones—laterally at alternate heights and towards the wider spaces.

This process, referred to the radial organs of plants in an early stage, will yield:—

1. The numbers of parts in question, successively.
2. The peculiar law of interpolations or of "divergence," viz.: by a number of interstices represented by the second preceding one of each cyclar number.
3. It will conclude the cycles, if it be supposed that the activity of each junior member depends on that of its progenital one; as in all cases of simple branch developments.

These numbers occur in like manner in the human frame, as follows:

Inclusive of the terminal (ossified or gristly) coccygeal element, we have exactly thirty-four spinal vertebræ.

Classifying nerves by their work, or "function," we find—

3 pairs of cervical nerves (neck).
5 pairs of brachial nerves (arms).
8 pairs of pedal nerves, composed of 3 crural (lumbar) and 5 ischiadic (sacral) ones.
13 pairs of nerves to the rump.
5 specific ones of the cranium.

34 in all; whereas the number of the spinal vertebræ, which inclose the spinal cord is exactly 21.

There are five pairs of "extremities," organised after a common plan: (1) the lower, (2) the upper, (3) the temporal (bearing the lower jaw for a "member"), (4) the palate-facial, with the upper jaw for its "member," (5) the opercular or hyo-tympanic one, forming the gill-lid in fishes or the tympanic ossicles in man; and the digital extremity of which is gradually converted into the (hand-like) crimped (external and internal) cartilages of the ear.

The five pair of hæmal arches of the cranium, *i.e.* the gill arches of fishes, are gradually transformed into the gristles of the gullet, &c.

The main variation consists in the varying, but "cyclar" number of "rays," fingers, &c.; the varying cyclar number of their joints (1, 2, 5, 8, 13 respectively in a dolphin, with five carpels instead of eight, as in a man) and the varying cyclar number of "loose" ossicles, such as *carpals*, *tarsals*, *teeth*, &c. The number of spinal vertebræ is also variable, but not that of the cranial ones.

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[*] Abstract of a Paper read at the Indianopolis Meeting of the American Association for the Advancement of Science, by Dr. T. C. Hilgard. Reprinted from the *American Naturalist*.